

UNITED STATES PATENT OFFICE.

JACOB REESE, OF PITTSBURG, PENNSYLVANIA.

UTILIZING PHOSPHORUS AND STEEL SCRAP IN THE BASIC PROCESS.

SPECIFICATION forming part of Letters Patent No. 285,431, dated September 25, 1883.

Application filed January 3, 1882. (No specimens.)

To all whom it may concern:

Be it known that I, JACOB REESE, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Utilizing Phosphorus and Steel Scrap in the Basic Process, of which the following is a specification.

In the practice of the Bessemer process silicon is relied upon as the chief caloric-producing substance in the metal. In ordinary practice it is found that two (2) per cent. of silicon in the metal is sufficient to keep the bath in a highly fluid condition during its treatment. Now, two (2) per cent. of the charge of ten (10) gross tons is four hundred and forty-eight (448) pounds; hence when ten (10) per cent. of steel scrap containing but little carbon and silicon is used in the bath to secure the four hundred and forty-eight (448) pounds of silicon it is merely necessary to use nine (9) tons of a metal containing 2.23 per cent. of silicon to form the initial bath in order to bring it up to two (2) per cent. of silicon after the scrap has been added, so that a large percentage of scrap—such as rail ends and bloom ends—may be utilized.

In the practice of the Bessemer basic process silicon is objectionable, because when oxidized it becomes highly destructive to the lime linings, requires large basic additions, which tend to chill the metal, and it otherwise tends to retard or prevent dephosphorization. Therefore as metal low in silicon is preferable for this process, and as the employment of such a metal robs the process of the chief caloric-producing agent of the Bessemer process, it becomes impossible to secure a degree of heat and fluidity in the metal which would permit the utilization of scrap by the basic Bessemer process.

In operating under the basic process the fact was discovered that silicon could be replaced with phosphorus as a heat-producing agent in the metal. My present invention, therefore, consists in utilizing the scrap by charging it into a bath of molten metal in the converter, containing not only a sufficient amount of phosphorus to compensate for the absence of the ordinary amount of silicon in

the metal, but also possessing enough to compensate for the absence of silicon and carbon in the scrap, so that the bath may contain sufficient caloric-producing substances to develop and maintain the proper degree of fluidity during its treatment.

In order that others skilled in the art may be enabled to carry out my invention, I shall explain my method of practice.

In converting ten (10) gross tons of metal by the Bessemer basic process into steel it is desirable that the metal should not contain over one-half ($\frac{1}{2}$) per cent. of silicon, and as the absence of the one and one-half ($1\frac{1}{2}$) per cent. of silicon will deprive the metal of two million six hundred and thirty thousand eight hundred and eighty (2,630,880) units of heat, this amount must be provided from some other source. This I do by the use of phosphorus. In converting ten (10) gross tons of metal by this process I use nine (9) tons of metal containing about one-half ($\frac{1}{2}$) per cent. of silicon, and one (1) gross ton of scrap minus silicon. In addition to the silicon in the nine (9) tons I also provide that there shall be present four hundred and fifty-eight (458) pounds of phosphorus. This will amount to 2.05 per cent. of the nine (9) tons; or when the metal does not contain that percentage of phosphorus, then in that case I admix a sufficient amount of ferrophosphorus with it so as to secure the aggregate amount of four hundred and fifty-eight (458) pounds of phosphorus required. In working such metal to one-half ($\frac{1}{2}$) per cent. of silicon when oxidized will give eight hundred and seventy-six thousand nine hundred and sixty (876,960) units centigrade of heat, and the four hundred and fifty-eight (458) pounds of phosphorus will give two million six hundred and thirty thousand eight hundred and eighty (2,630,880) units centigrade, and by this means twenty-two hundred and forty (2,240) pounds of scrap, which contains but a trace of silicon, may be used in each heat, and by increasing the amount of phosphorus an increased percentage of scrap may be used. The scrap may be charged with the metal into the cupola, melted and run into the converter; or it may be charged either hot or cold into the bath in the converter.

The use of scrap in the ordinary Bessemer process is old, and I make no claim for its use in that manner. In that case the silicon supplies the caloric deficient in the scrap, while
5 my invention is the utilization of scrap by mixing it with metal high in phosphorus, and then subjecting the mixture, while in a molten state, to the action of an air-blast, while in a basic-lined vessel and in the presence of basic
10 additions, until the phosphorus is eliminated; but I make no claim in this case to the manufacture or use of phosphoric metal, except as far as relates to its use in connection with scrap, as herein set forth; nor do I now
15 claim the process of purifying iron by subjecting it to an air-blast while in a basic-lined converter and in the presence of basic additions, said process having been heretofore pat-

ented by me—to wit, on the 19th day of June, 1883, No. 279,596—but

What I do claim is—

The within-described process for utilizing scrap, which consists in charging said scrap, in company with molten metal possessing a sufficient excess of phosphorus to yield the
25 caloric necessary for the process, into a basic-lined converter in presence of basic additions, and there subjecting the same to an air-blast until the metal is dephosphorized, substantially in the manner and for the purposes set
30 forth.

JACOB REESE.

Witnesses:

JAMES H. PORTE,
WALTER REESE.